

THIS IS A
LET'S-READ-AND-FIND-OUT
SCIENCE BOOK

HIGH SOUNDS, LOW SOUNDS

by
FRANKLYN M. BRANLEY
illustrated by Paul Galdone



A
LET'S-READ-AND-FIND-OUT SCIENCE BOOK

HIGH SOUNDS, LOW SOUNDS

The world around us is full of sounds – bangs and shouts, pops and roars, people talking and music playing. And every sound we hear is made by something that is moving. This clear and lively book explains exactly how vibrations are made, how they are carried through the air to our ears, and so produce sound.

Experiments that make use of such everyday objects as spoons and string and soda straws help the young reader understand the nature of sound.

Franklyn Branley's lucid account and Paul Galdone's cheerful pictures make **HIGH SOUNDS, LOW SOUNDS** an exciting introduction to physics.

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by FRANKLYN M. BRANLEY
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LOW SOUNDS

Thomas Y. Crowell Company
New York





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— LET'S-READ-AND-FIND-OUT SCIENCE BOOKS —

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Dr. Franklyn M. Branley, Astronomer Emeritus and former Chairman of the American Museum—Hayden
Planetarium

<i>A Baby Starts to Grow</i>	<i>How You Talk</i>	<i>A Tree Is a Plant</i>
<i>Bees and Beelines</i>	<i>It's Nesting Time</i>	<i>Use Your Brain</i>
<i>Birds Eat and Eat and Eat</i>	<i>Ladybug, Ladybug, Fly Away Home</i>	<i>Water for Dinosaurs and You</i>
<i>A Drop of Blood</i>	<i>My Five Senses</i>	<i>What I Like About Toads</i>
<i>Follow Your Nose</i>	<i>My Visit to the Dinosaurs</i>	<i>What Makes Day and Night</i>
<i>Hear Your Heart</i>	<i>Oxygen Keeps You Alive</i>	<i>What the Moon Is Like</i>
<i>High Sounds, Low Sounds</i>	<i>Straight Hair, Curly Hair</i>	<i>Why Frogs Are Wet</i>
<i>How a Seed Grows</i>	<i>The Sunlit Sea</i>	<i>Your Skin and Mine</i>

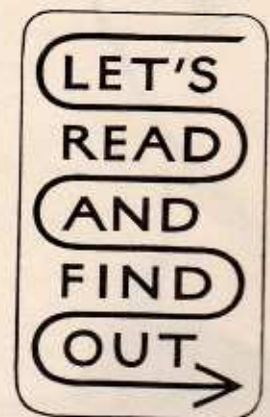
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HIGH SOUNDS, LOW SOUNDS





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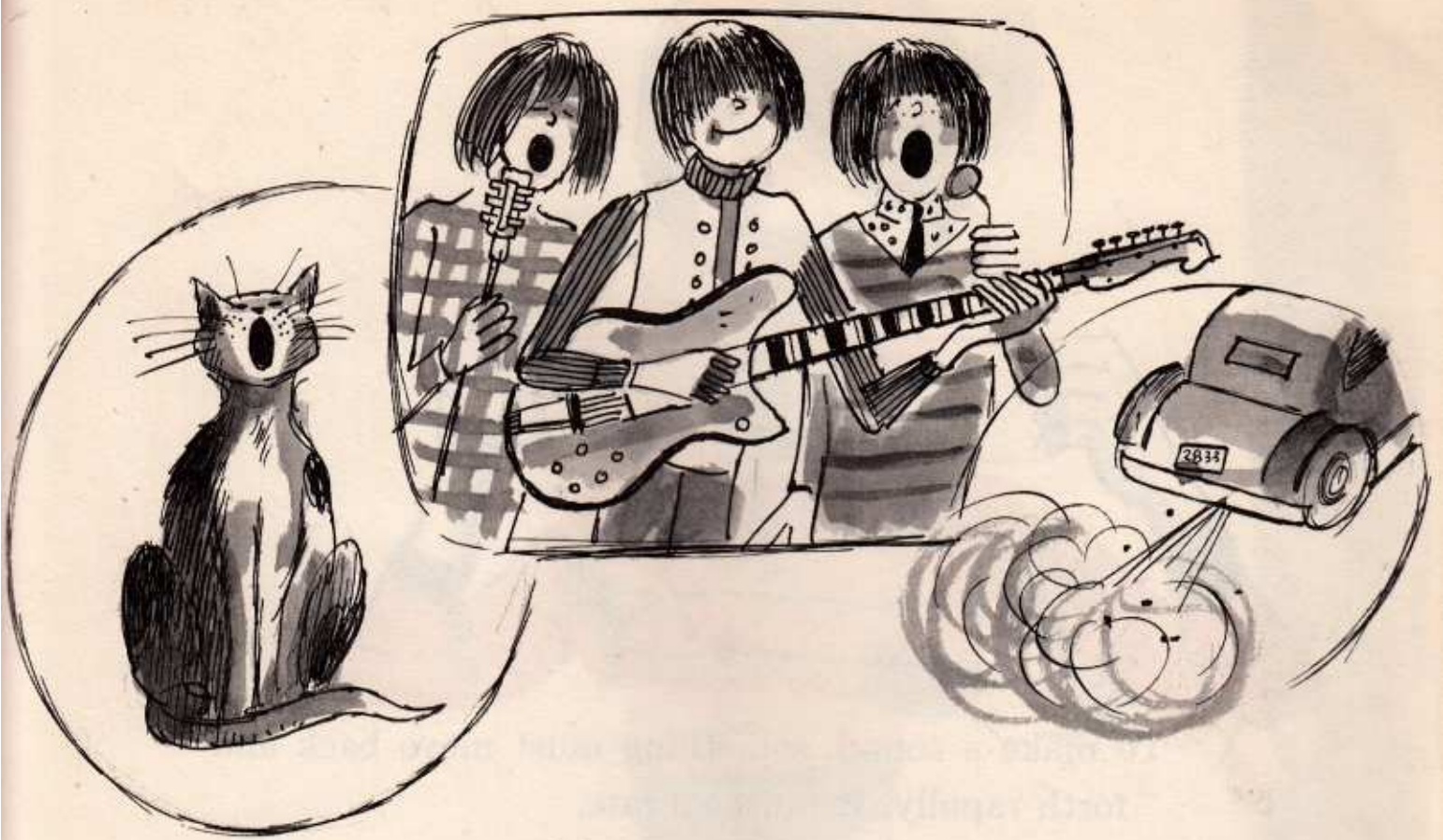
Listen.
What do you hear?

What do you hear?	What do you hear?	What do you hear?
What do you hear?	What do you hear?	What do you hear?
What do you hear?	What do you hear?	What do you hear?
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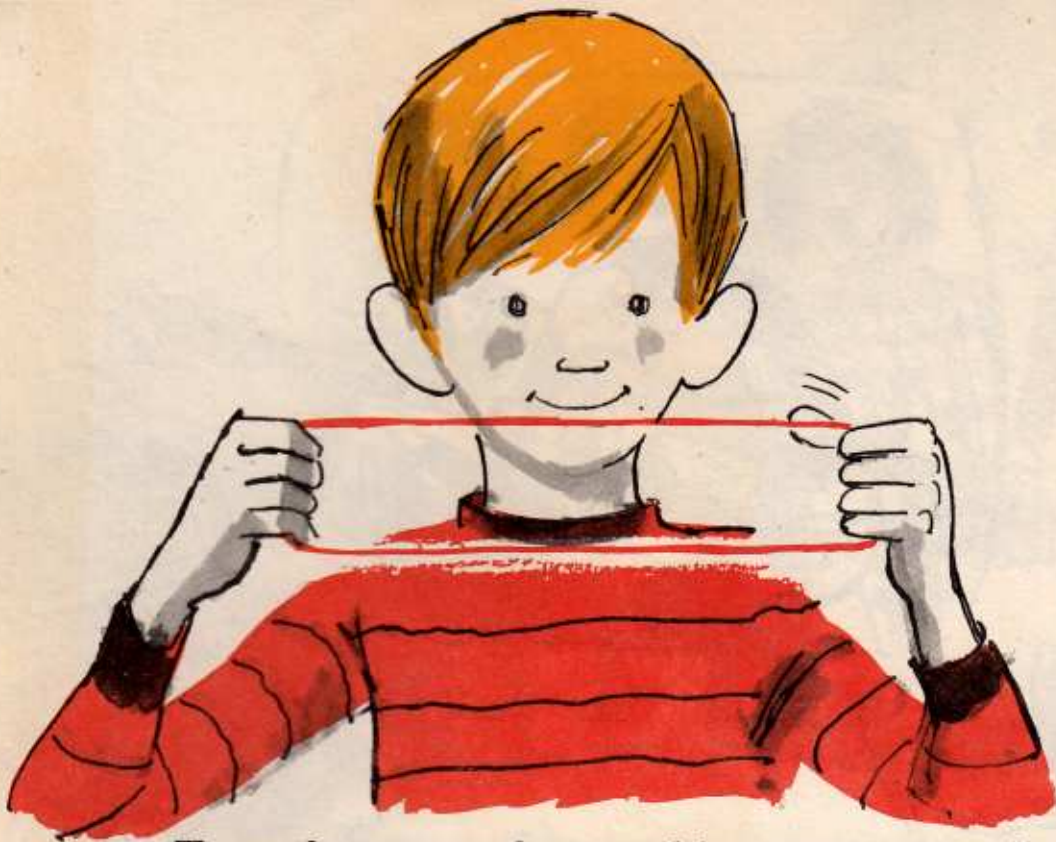






You hear bangs and shouts, pops and roars, music
and noise.

Every sound that you hear is made by something
that is moving.



To make a sound, something must move back and forth rapidly. It must vibrate.

When things vibrate very fast, you cannot see them move.

When they vibrate more slowly, you can see the motion. If you vibrate a rubber band, you can see it move.

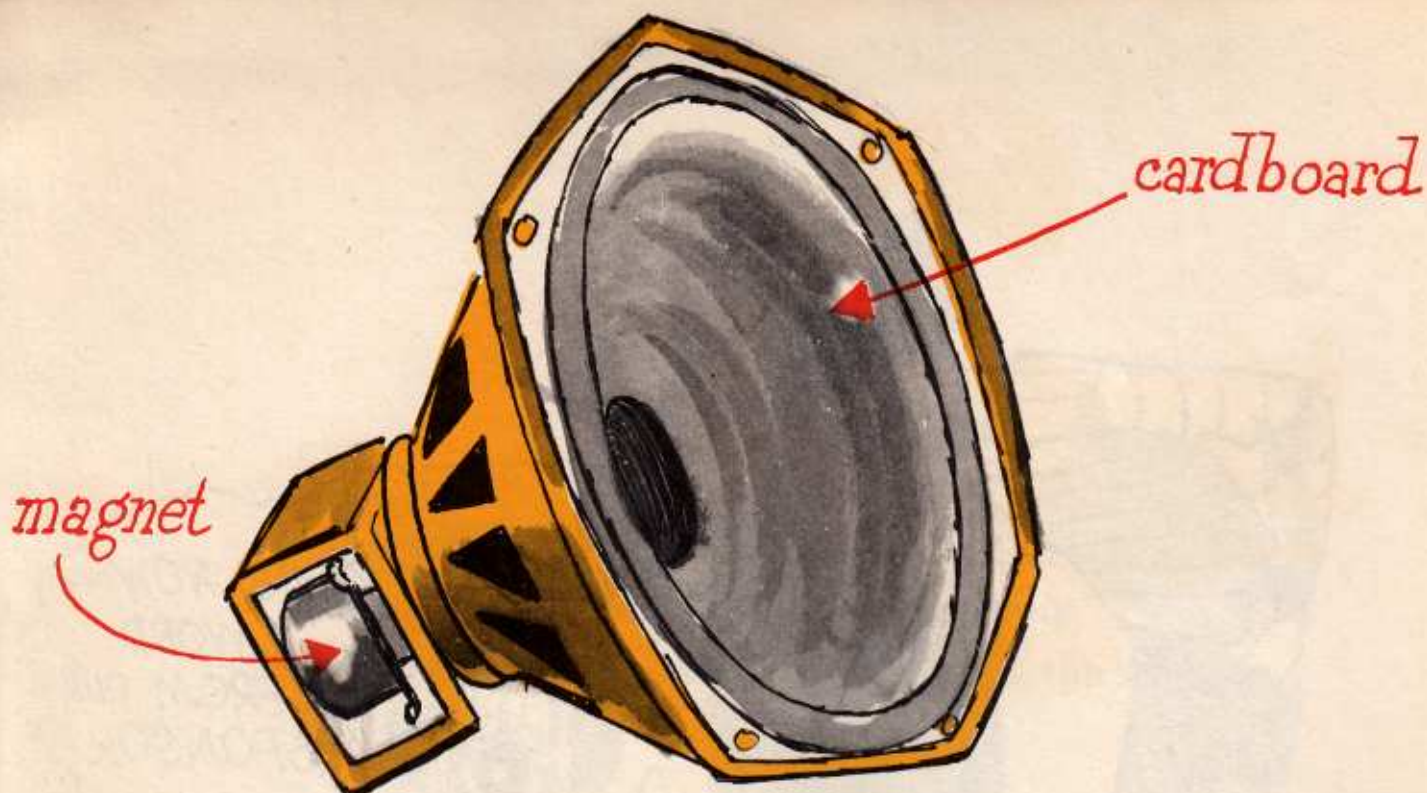


Loop a rubber band over a doorknob. Stretch the rubber band and then pluck it with your fingers. You hear a sound, and you see the rubber band vibrate back and forth.

When it stops moving, you don't hear any sound.

You can hear a radio or TV, yet nothing seems to
move. You cannot see anything vibrate.
The whole set does not move. But inside the set there
is a speaker that does move.

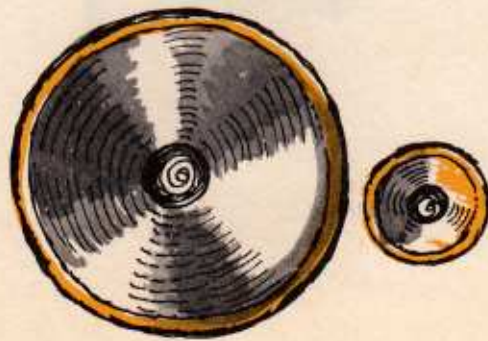




The speaker is a piece of cardboard shaped like a cup, or a cone. It is fastened to a magnet. When you turn on the set, electricity goes through the magnet. This makes the magnet move. The cardboard moves, too, because it is fastened to the magnet. The cardboard vibrates.



All radios, even tiny sets, have speakers in them. Big radios have both big and little speakers. The big ones move slowly. They make low sounds, and are called woofers. The little ones vibrate very fast. They make high sounds, and are called tweeters.



When things vibrate slowly, they make low sounds.

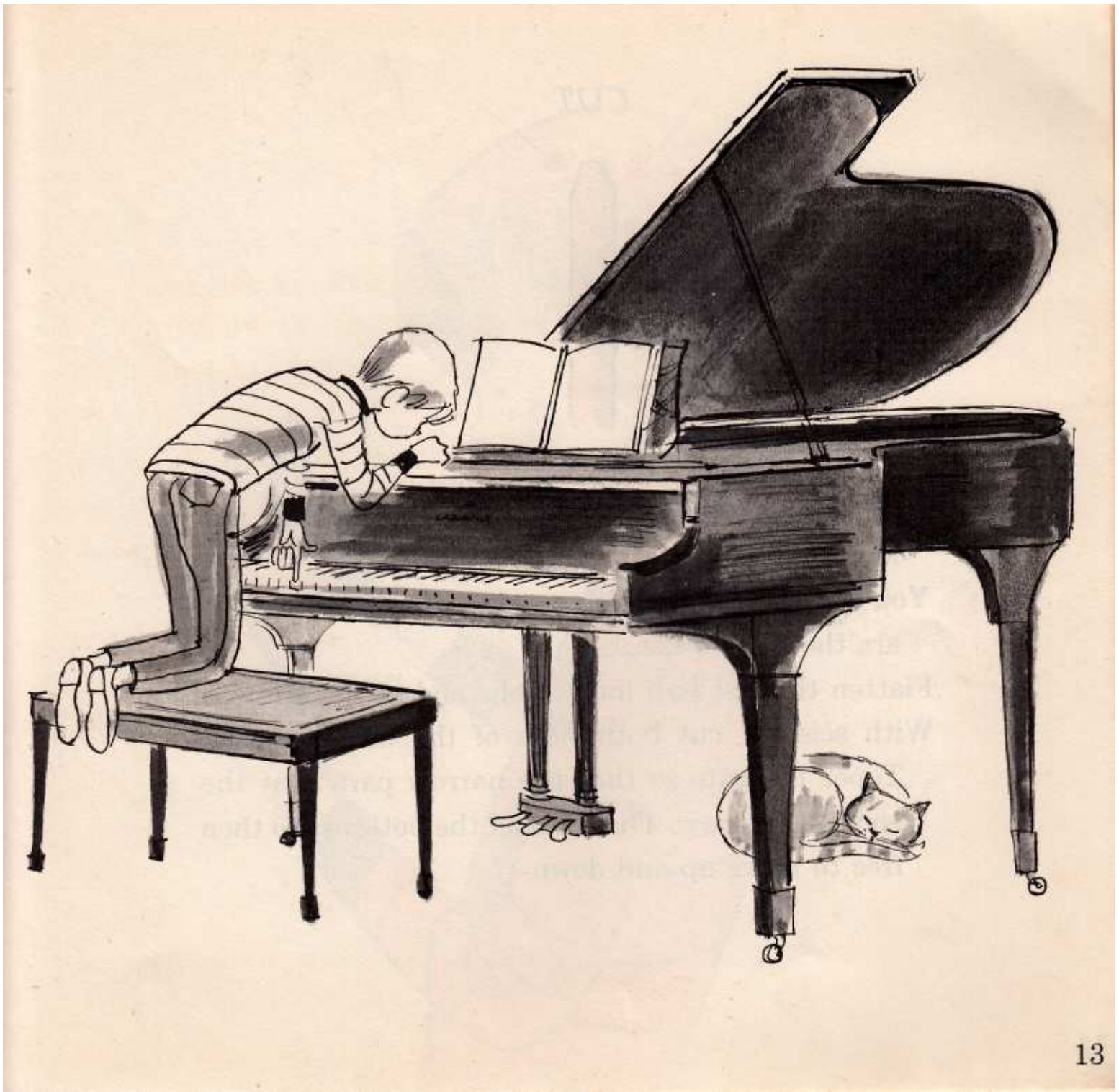
When they vibrate fast, they make high sounds.

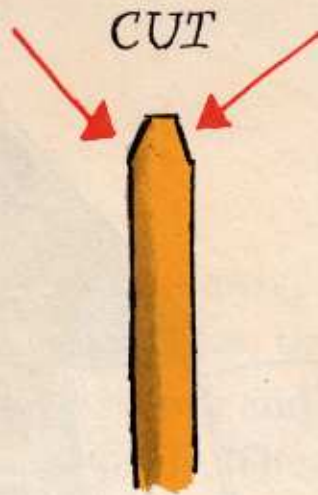
A piano has long strings and short strings. The long strings vibrate slowly. They make low sounds. The short strings vibrate fast. They make high sounds.

Look inside a piano. Strike one of the low keys.

Watch the string that makes the note. You can see it vibrate.

Strike a high key on the piano. You can hear the sound, but you cannot see the string move. That's because it vibrates very fast.





You don't need a piano to make high sounds and low sounds.

You can make them with a soda straw. Paper straws are the best to use.

Flatten the last half inch of one end of the straw.

With scissors, cut both sides of the flattened end.

Taper the cuts so that the narrow part is at the end of the straw. The top and the bottom are then free to move up and down.





Hold the flattened end of the straw between your lips and blow through the straw.

You should make a sound. If you do not, try blowing harder. If you still get no sound, blow softer. Also, move the straw a little farther into your mouth, or out a little. After some practice you will be able to make a steady tone.

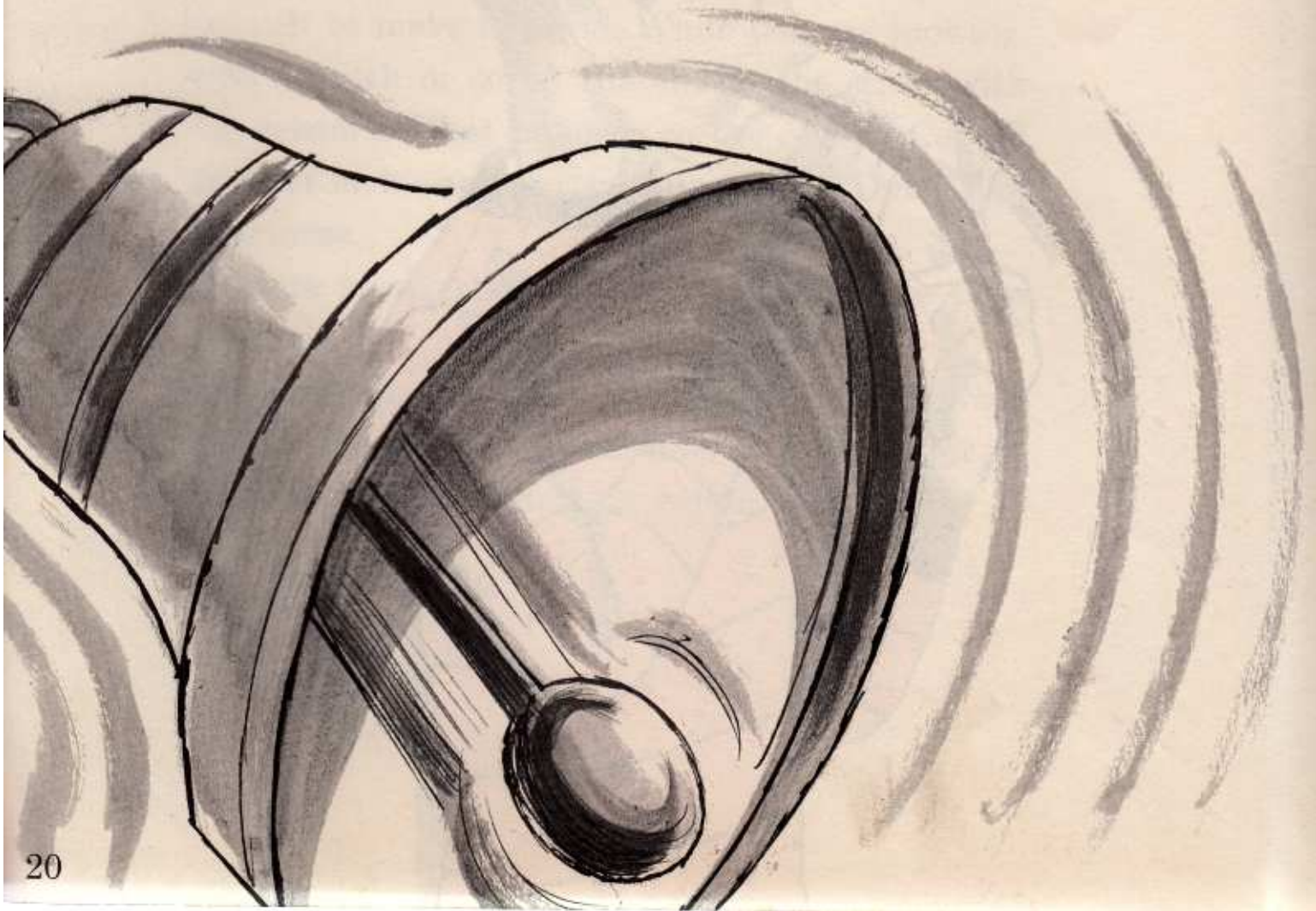
When you have learned how to make the sound, try this. Hold the straw in one hand, and a pair of scissors in the other hand. Keep blowing hard enough to make a sound. While you are blowing, snip an inch or so off the end of the straw with the scissors. What happens to the sound? Cut off another inch—and another. Be careful. Don't snip your nose.

The more straw you cut off, the higher the note becomes.

That's because the straw and the air in it vibrate faster. The shorter something is, the faster it vibrates and the higher the sound.



You can make a sound like a church bell with a spoon and a piece of string. And you can also see one way that vibrations can travel.



Here is how to do it:

Tie a metal spoon to the middle of a piece of string.

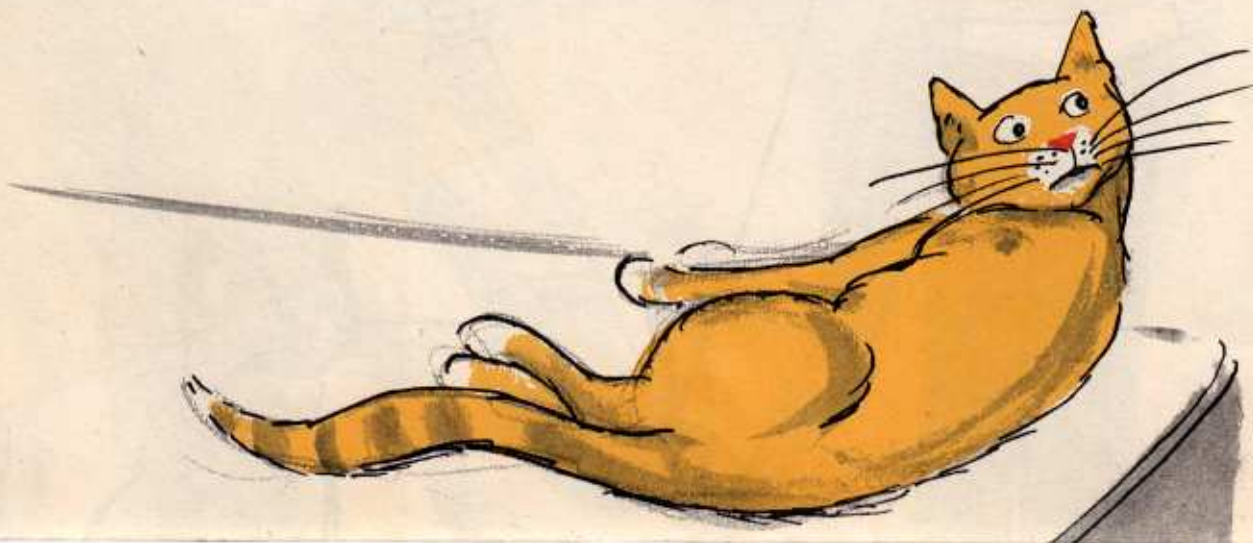
The string should be three feet long.



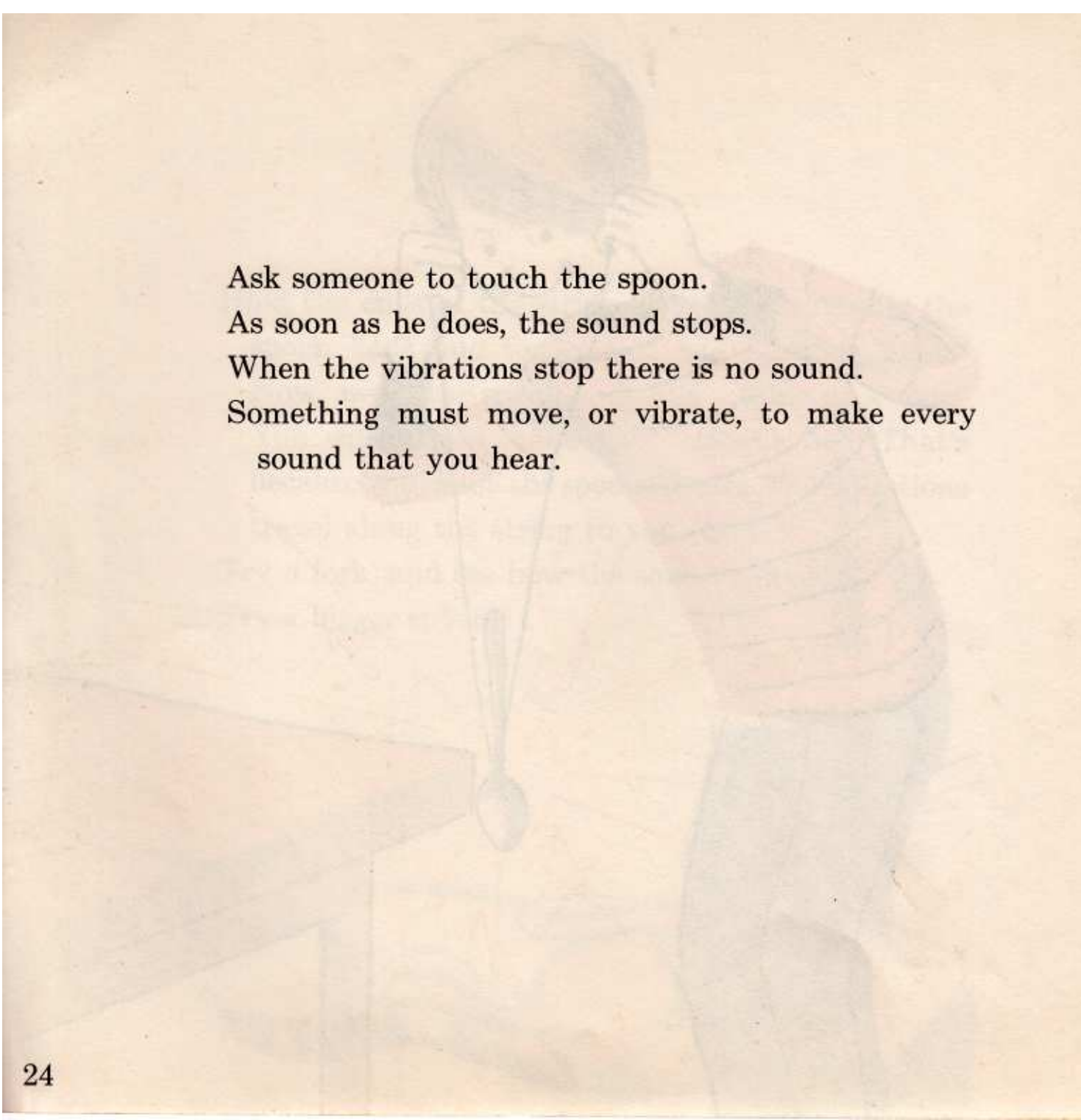
Hold the ends of the string in your ears. Swing the spoon back and forth. You will hear no sound. Now, swing the spoon so it hits a table or a chair. You will hear a sound like a church bell. That's because you made the spoon vibrate. The vibrations travel along the string to your ears.

Try a fork, and see how the sound changes.

Try a bigger spoon.



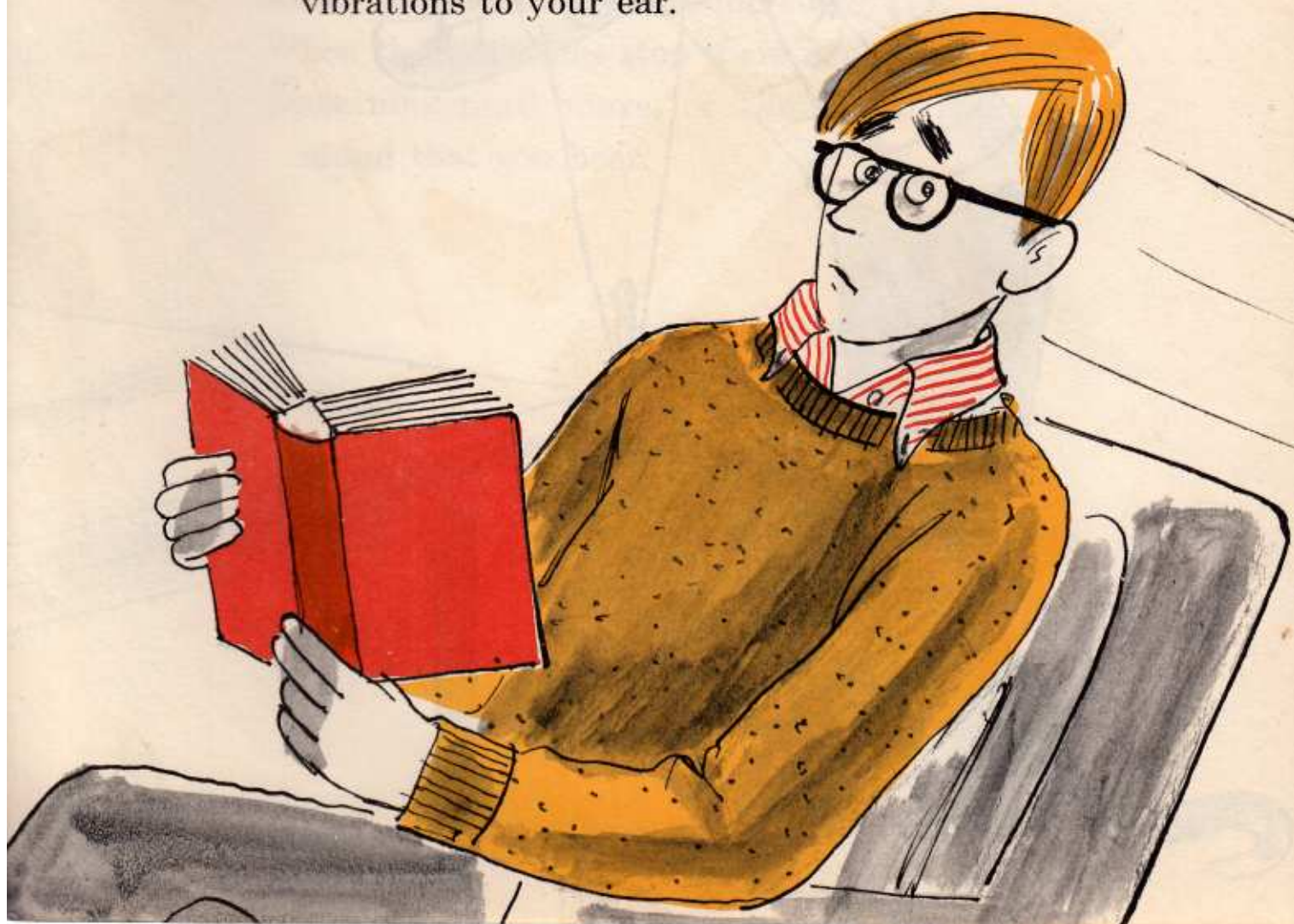


A faint, light-colored illustration in the background shows a child with dark hair, wearing a striped shirt, holding a spoon. The child's hand is near their ear, and the spoon is positioned as if it might be touching or near a surface. The overall style is soft and artistic, typical of a children's book illustration.

Ask someone to touch the spoon.
As soon as he does, the sound stops.
When the vibrations stop there is no sound.
Something must move, or vibrate, to make every
sound that you hear.



When something vibrates, it makes the air all around it vibrate. Air can move back and forth rapidly, just as the strings in a piano can. You hear sounds because air vibrates. Air carries vibrations to your ear.



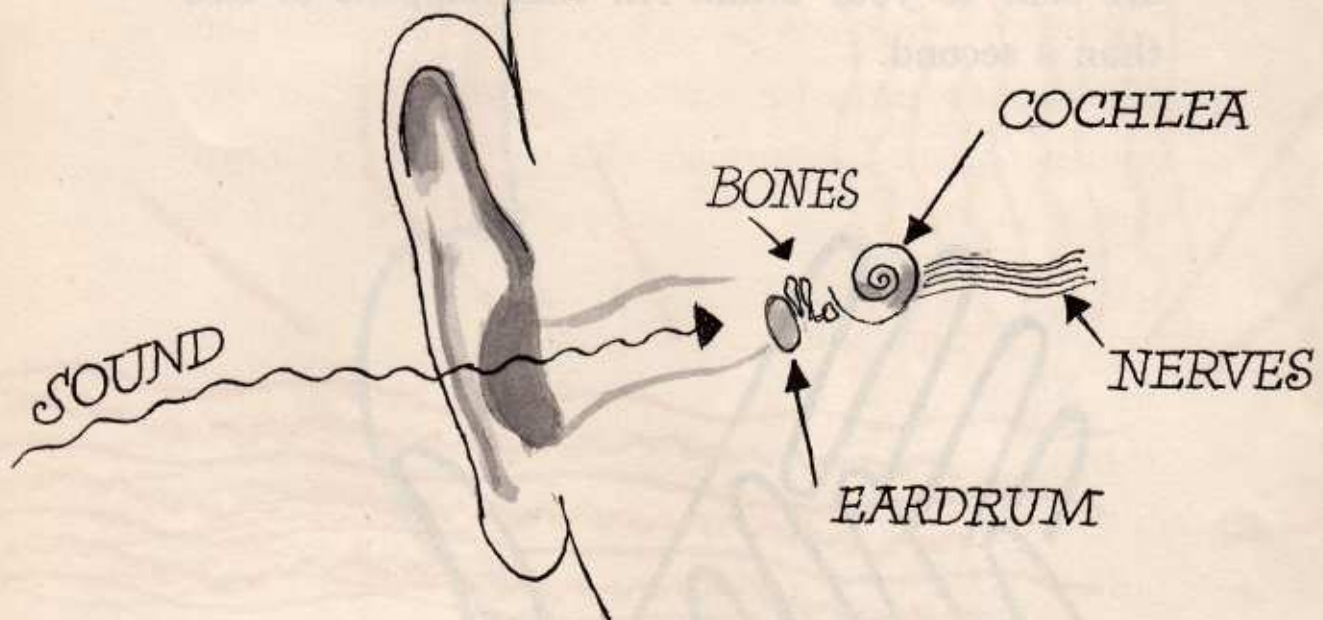


The outer part of your ear catches the vibrations and carries them into the opening of your ear. Inside your ear there is a tunnel. The vibrations go down the tunnel and strike against a thin wall. This is your eardrum.

When vibrations hit your eardrum, they make it vibrate. The eardrum vibrates like the top of a drum.

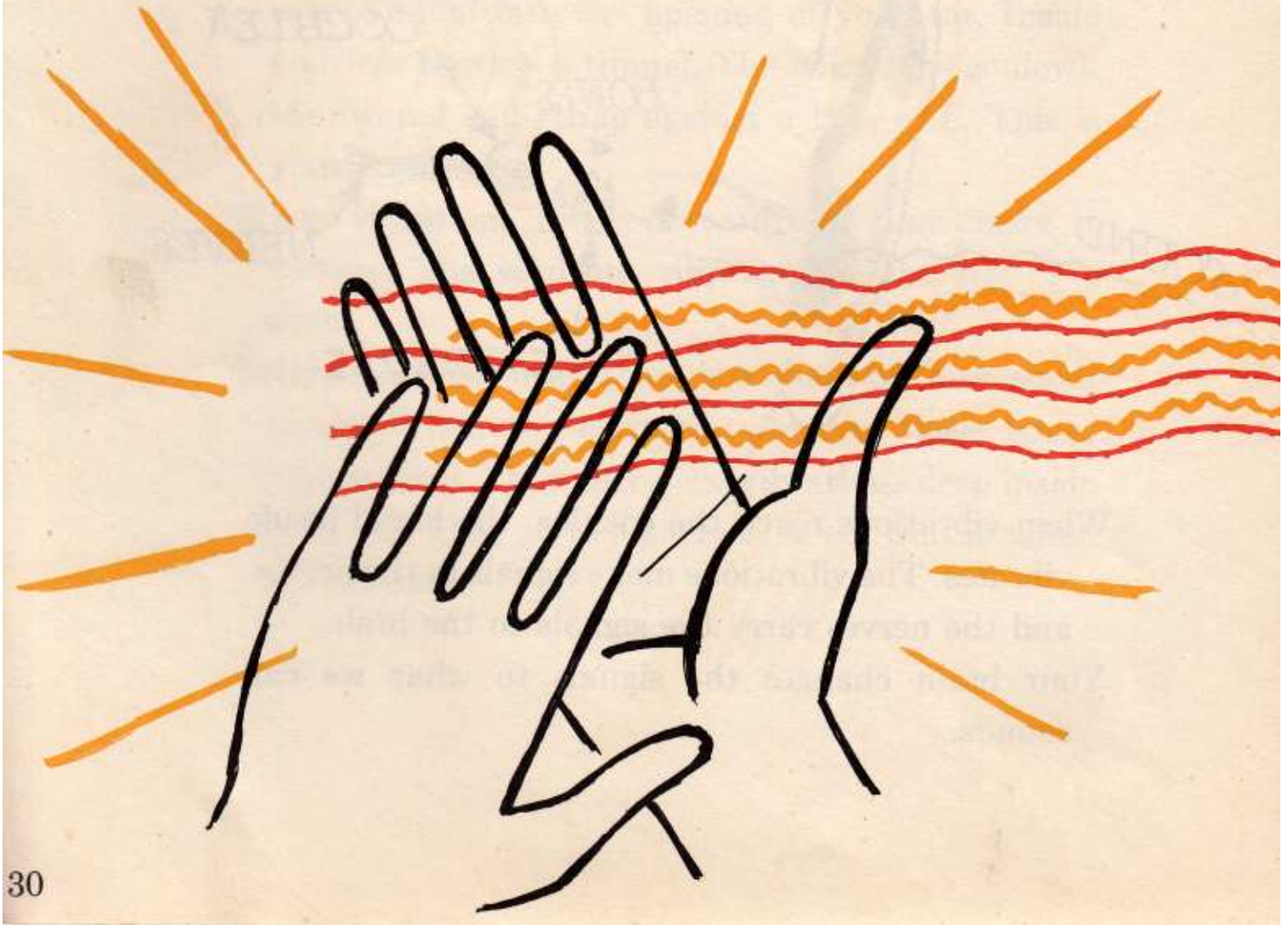
Behind your eardrum there is a chain of three small bones. When the eardrum vibrates, these bones vibrate also. They carry the vibrations deep inside your ear. They go to a part of the ear that is called the cochlea.

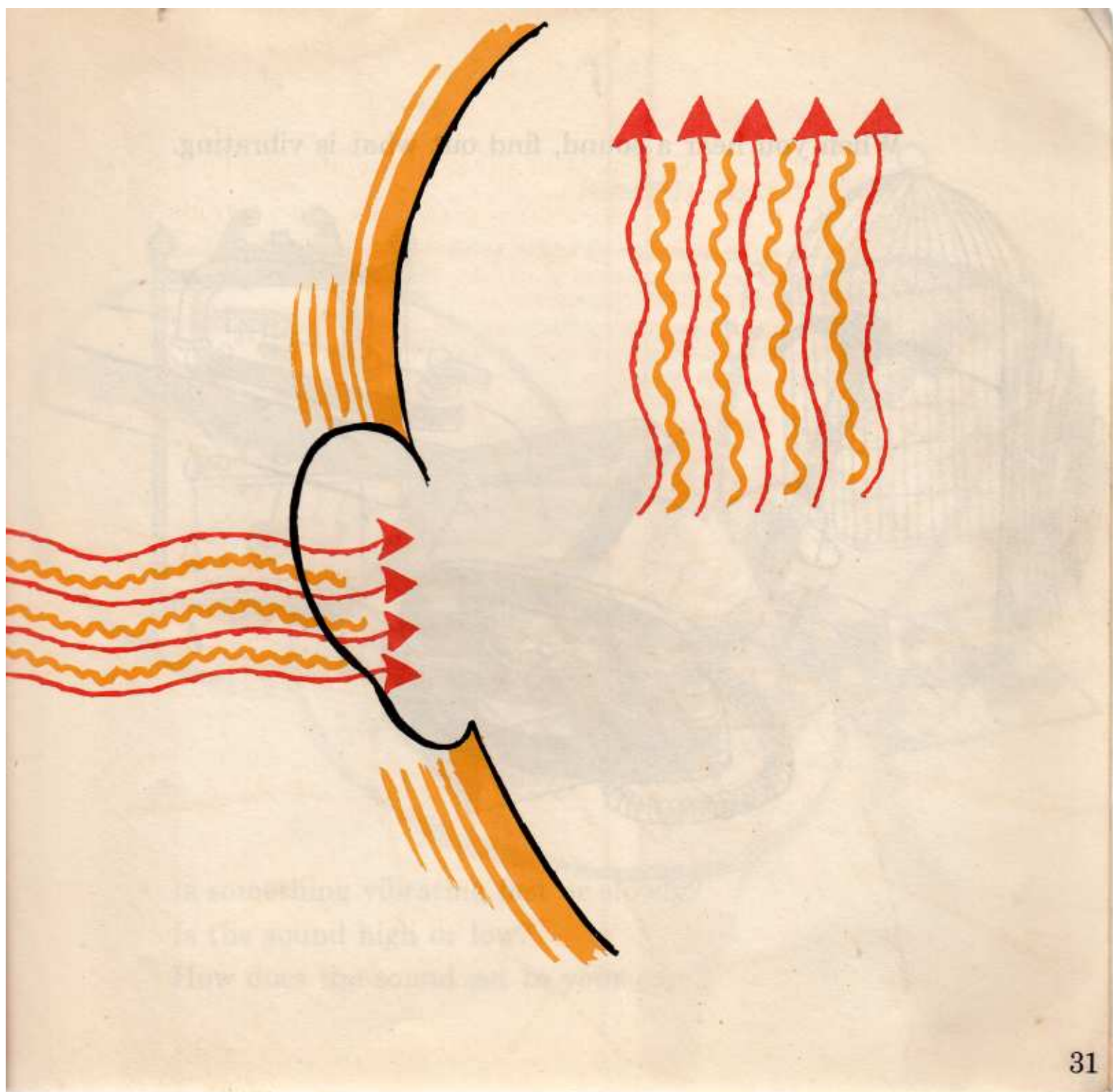
The cochlea is shaped like a small ball. It has liquid inside it. Nerves that connect the ear to the brain dip into this liquid.



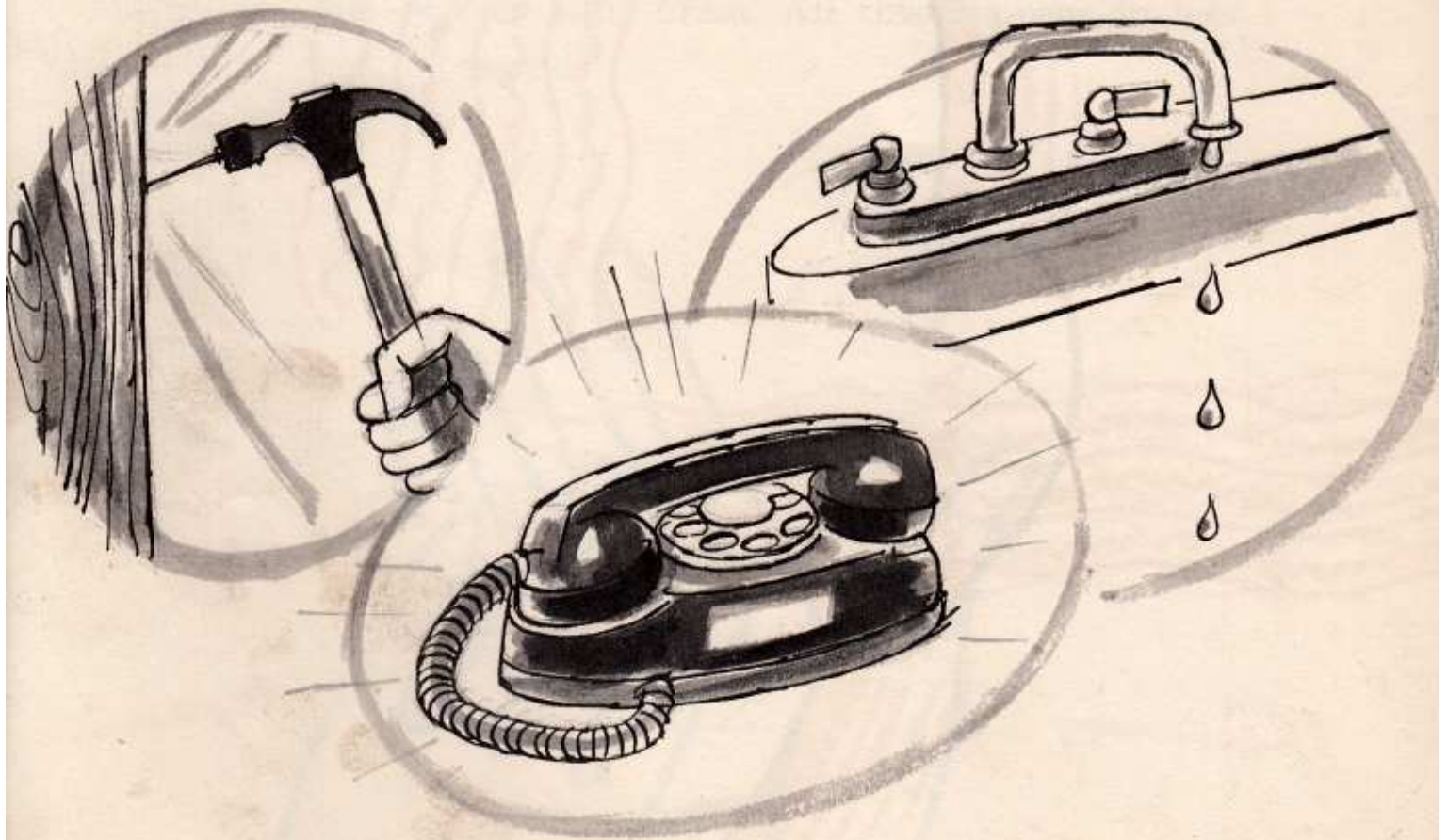
When vibrations reach the cochlea, the liquid inside vibrates. The vibrations make signals in the nerves, and the nerves carry the signals to the brain. Your brain changes the signals to what we call sounds.

A sound is made. Vibrations travel to your ear. They vibrate the eardrum and the cochlea. And signals are sent to your brain. All this happens in less than a second.





When you hear a sound, find out what is vibrating.





Is something vibrating fast or slowly?
Is the sound high or low?
How does the sound get to your ears?

DINNER

Listen.

What do you hear?



IS READY



ABOUT THE AUTHOR

FRANKLYN M. BRANLEY is well known as the author of many excellent science books for young people of all ages. He is also co-editor of the Let's-Read-and-Find-Out Science Books.

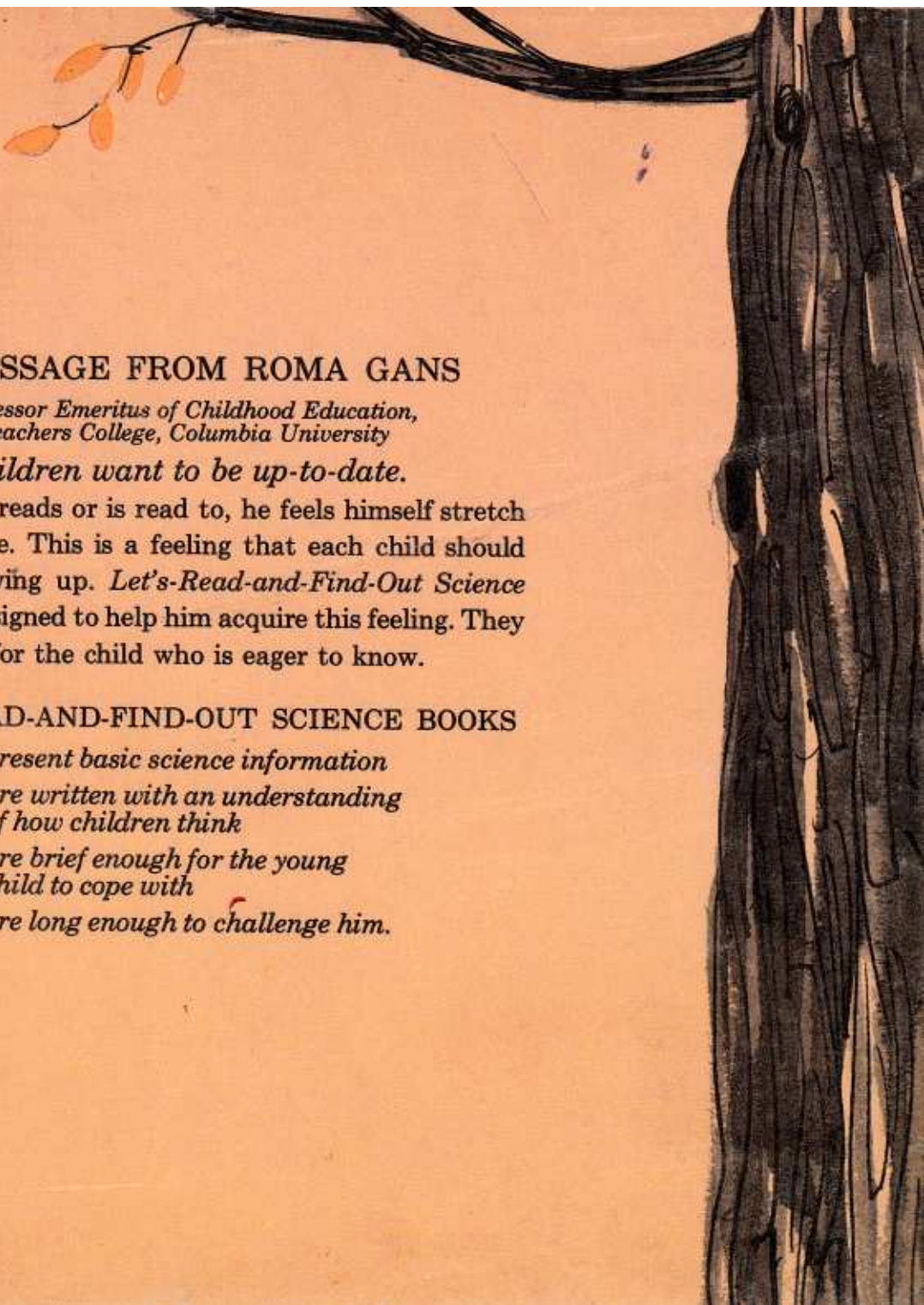
Dr. Branley is Astronomer Emeritus and former Chairman of the American Museum-Hayden Planetarium in New York City.

He holds degrees from New York University, Columbia University, and from New York State University College at New Paltz. He and his wife live in Woodcliff Lake, New Jersey.

ABOUT THE ILLUSTRATOR

PAUL GALDONE is considered one of the outstanding illustrators of children's books today. He studied at the Art Students League in New York with George Grosz and others. Much of Mr. Galdone's spare time is spent in sketching from nature.

Mr. Galdone came to the United States as a boy from Budapest. He now lives in Rockland County, New York.



A MESSAGE FROM ROMA GANS

*Professor Emeritus of Childhood Education,
Teachers College, Columbia University*

Children want to be up-to-date.

As a child reads or is read to, he feels himself stretch in importance. This is a feeling that each child should have in growing up. *Let's-Read-and-Find-Out Science Books* are designed to help him acquire this feeling. They are planned for the child who is eager to know.

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1. *present basic science information*
2. *are written with an understanding of how children think*
3. *are brief enough for the young child to cope with*
4. *are long enough to challenge him.*